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EXAMINER	
TIBBITS, PIA FLORENCE	

ART UNIT	PAPER NUMBER
2838	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/099,932	DYKEMAN, STEVE W.	
	Examiner	Art Unit	
	Pia F Tibbits	2838	MW

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-66* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-66* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 March 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *6/18/02* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Priority

1. Applicant's claim for domestic priority under 35 U.S.C. 119(e) is acknowledged.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the charging pulse voltage component must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

4. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter: "selected points". See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction is required.

Claim Objections

5. Claims 1, 3, 37 are objected to because of the following informalities:

claim 1: "parameters that respond" should be changed to read ---parameters that change---.

claim 3: "a square current pulse" should be changed to read --- a square shaped pulse ---.

claim 37: "monitoring voltage" should be changed to read --- monitoring a voltage ---.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-66 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1: the recitation "the charging pulse has a current component and a voltage component" is not clear since a pulse is a signal, and a signal cannot charge a battery. A voltage/current applied to a battery charges it. To continue prosecution, it was assumed that the pulse generator communicates with a controller, and is responsive to commands from the controller to configure charging pulses according to SOC determination.

the statement following "adapted to" is ambiguous, and MPEP 2106 states that "Language that suggests or makes optional but does not require steps to be performed or does not limit a claim to a particular structure does not limit the scope of a claim or claim limitation may raise a question as to the limiting effect of the language in a claim".

Claim 7: the recitation "the voltage component of the charging pulse" is not clear. See also remarks for claim 1 above.

Claim 9: the recitation "the control module maintains the charging voltage at a selected voltage level by adjusting the configuration of the current component of the charging pulses" is not clear. See also remarks for claims 1 and 7 above.

Claim 11: the recitation "maintaining the charging voltage at the selected voltage level comprises maintaining the existing configuration of the current component if the monitored charging voltage is approximately equal to the selected voltage level" is not clear. See also remarks for claims 1, 7, and 9 above.

Claim 18: the recitation "the selected quiescent voltage level is approximately 13.5 volts" is not clear on what basis 13.5V is selected, since applicant's own specification describes the quiescent voltage on page 2 of the specification, as "indicative of the charge state of a given battery, and the terminal

voltage during a charge pulse relative to the quiescent voltage is indicative of the charge absorption rate".

Claim 24: the recitation "the current component of the charging pulse" is not clear. See also remarks for claim 1 above.

Claim 27: the recitation "the control module maintains the post-discharge voltage at a selected post-discharge voltage level by adjusting the configuration of the current component of the charging pulses" is not clear. See also remarks for claims 1 and 24 above.

Claim 36: the recitation "the duty cycle is monitored while maintaining the quiescent voltage at a specified level" is not clear since the duty cycle is monitored during charging, and therefore the quiescent voltage/SOC of the battery would increase during this process.

Claim 37: the recitation "monitoring voltage of the battery during selected points of each charging cycle" is not clear, since the voltage of the battery is monitored continuously to be sure its value is in a "range from a quiescent voltage to a maximum voltage".

Claim 66: the recitation "a wide variety of batteries" is indefinite.

The above are but a ***few*** specific examples of indefinite and functional or operational language used throughout the claims, and are only intended to illustrate the extensive revision required to overcome the rejection under 35 USC 112, second paragraph. The above-mentioned corrections therefore, are in no way a complete and thorough listing of every indefinite and functional or operational language used throughout the claims. Applicant is required to revise all of the claims completely, and not just correct the indefinite and functional or operational language mentioned. The following art rejections are given in view of the above rejections of claims under 35 USC 112, second paragraph. Therefore, the following art rejections are applied only as far as the claims are understood in view of rejections made under the second paragraph of 35 USC 112.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. Claims 1-3, 16, 17 are rejected under 35 U.S.C. 102(e) as being anticipated by **Ding et al.** [hereinafter Ding][6094033].

Applicant defines a quiescent voltage on page 2 of the specification as "indicative of the charge state of a given battery". To continue prosecution, the quiescent voltage was interpreted to mean SOC detected, which indicates battery charge acceptance.

Ding discloses in figures 1-15 a battery charging system comprising: a power supply 34 that provides cyclic charging pulses to a battery 12; a battery monitoring circuit 22 monitoring one or more of battery's parameters that respond to the charging pulses; and a control module 28 that adjusts the configuration of the current component of the charging pulses so as to maintain the voltage component in a range between the quiescent voltage/SOC and the maximum voltage/"SOC reaches 100% in response" to the monitored battery parameter [see also the abstract; column 2 , lines 54-58; column 6, lines 39-67; column 7, lines 1-25].

As to claim 2, Ding discloses in fig.11B and 11C that the charging pulse is a positive pulse.

As to claim 3, Ding discloses in fig. 12A the current component of the charging pulse comprises a square shaped pulse having first amplitude and a first width, and wherein the charging cycle has a first period [see also fig.14; column 9, lines 1-17].

As to claim 7, Ding discloses in the abstract that the charging signal is a pulse width and amplitude modulated **current**, voltage or power waveform with the amplitude and pulse width of each

charging pulse being selected based upon the detected battery SOC. Predetermined battery parameters, such as equivalent circuit capacitance and **resistance**, electrochemical overcharge, maximum battery temperature, and maximum battery internal pressure, among others, also can be compared with monitored values during the battery charging process to control the charging signal in order to avoid battery damage.

As to claim 16, with regard to the limitation of having the control module further maintains the quiescent voltage at a selected quiescent voltage level by adjusting the configuration of the current component of the charging pulses wherein the quiescent voltage provides some indication of charge state of the battery, it is an inherent function of the charger controller disclosed by Ding to continuously monitor the battery parameters, recalculate the battery SOC, and determine whether charging is required by determining a battery's SOC on a frequent basis during the charging process and adjusting its charging algorithm according to the instantaneous charge receptivity of the battery being charged in order to promote an efficient and rapid battery charging process, and thereby facilitating optimum performance from the battery, and MPEP 2100 states that the disclosure of a limitation may be expressed, implicit or **inherent.**

As to claim 17, Ding discloses lead acid batteries [see also column 1, lines 26, 27, and 34].

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 4-6, 8, 10-15, 18-23, 37-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ding**, as described above.

Ding discloses a battery charging system comprising: a power supply that provides cyclic charging pulses to a battery, a battery monitoring circuit monitoring one or more of battery's parameters

that respond to the charging pulses, and a control module that adjusts the configuration of the current component of the charging pulses so as to maintain the voltage component in a range between the quiescent voltage/SOC and the maximum voltage/"SOC reaches 100% in response" to the monitored battery parameter. Ding does not disclose specifically the first amplitude having a range of approximately 0 to 20 Coulombs/second, the first width having a range of approximately 50 to 1000 milliseconds, the first period has a range of approximately 100 to 2000 milliseconds.

As to claim 4, Ding discloses that the amplitude of each charging pulse 102 as well as the average current for each group of pulses can be from approximately 0.003 C to approximately 20 C [see also column 9, lines 13-16].

As to claim 5, Ding discloses that the pulse width W_{102} of each pulse 102 should be between approximately 10 ms to approximately 1 second. [see also column 9, lines 16-18].

pulse width

As to claim 6, Ding discloses that the rest periods 104 between each pulse 102 and rest periods 109 between pulse groups are between approximately 1 millisecond to approximately 10 minutes, with pulse width and rest period duration being determined based on battery conditions, such as temperature, pressure, etc

With regard to claims 4-6: the first amplitude having a range of approximately 0 to 20 Coulombs/second, the first width having a range of approximately 50 to 1000 milliseconds, the first period has a range of approximately 100 to 2000 milliseconds, absent any criticality, is only considered to be the use of "optimum" values that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result effective variable involves only routine skill in the art. ***In re Boesch***, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **See also MPEP 2144.05 statement with regard to "obviousness of ranges".**

As to claims 8, 19, Ding discloses that once all relevant battery information is received by the processor 22, the processor computes a working SOC, and that voltage pulses also can be utilized

(examples of representative SOC determination of pulse wave, and single pulse wave forms are shown in figures 11A-11E), and that after a working SOC is calculated at block 44 (fig. 9), the detector 10 determines whether charging is required at block 64 [see also column 7, lines 3-5, and lines 47-50; column 8, lines 16-18]. One skilled in the art would be able to interpret that the battery monitoring circuit monitors the quiescent voltage and the maximum voltage wherein a charging voltage is defined as the difference between the maximum voltage and the quiescent voltage and wherein the charging voltage is indicative of the battery's ability to absorb charge.

As to claim 10, the selected voltage level being approximately 1 volt, absent any criticality, is only considered to be the use of "optimum" values that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result effective variable involves only routine skill in the art. ***In re Boesch***, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **See also MPEP 2144.05 statement with regard to "obviousness of ranges".**

As to claim 11, maintaining the charging voltage at the selected voltage level comprises maintaining the existing configuration of the current component if the monitored charging voltage is approximately equal to the selected voltage level: Ding discloses that once all relevant battery information is received by the processor 22, the processor computes a working SOC, and that voltage pulses also can be utilized (examples of representative SOC determination of pulse wave, and single pulse wave forms are shown in figures 11A-11E), and that after a working SOC is calculated at block 44 (fig. 9), the detector 10 determines whether charging is required at block 64 [see also column 7, lines 3-5, and lines 47-50; column 8, lines 16-18].

As to claims 12, 20, Ding discloses that when a battery SOC is determined to be 50% at time T_1, (fig. 15), such as in block 44 of fig. 9, and a rapid charge sequence is selected for battery charging, such as in block 80 of fig. 9, a pulse group 100 is sent to the battery. The amplitude A_{102} of each charging pulse 102 within pulse group 100 is calculated in reference to the value corresponding to 50% SOC on the diagram of fig. 14. With regard to the limitation of maintaining the charging voltage at the selected

voltage level comprises increasing the first amplitude of the current pulse by a selected amount if the monitored charging voltage is less than the selected voltage level: it is an inherent function of the charger controller to continuously monitor the battery charging voltage at the selected voltage level, and MPEP 2100 states that the disclosure of a limitation may be expressed, implicit or **inherent.**

As to claim 13, the selected amount of current pulse increase being approximately 0.05C/second, absent any criticality, is only considered to be the use of "optimum" values that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result effective variable involves only routine skill in the art. ***In re Boesch***, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **See also MPEP 2144.05 statement with regard to "obviousness of ranges".**

As to claim 14, with regard to the limitation of maintaining the charging voltage at the selected voltage level comprises decreasing the first amplitude of the current pulse by a selected amount if the monitored charging voltage is less than the selected voltage level: it is an inherent function of the charger controller to continuously monitor the battery charging voltage at the selected voltage level, and MPEP 2100 states that the disclosure of a limitation may be expressed, implicit or **inherent.**

As to claim 15, the selected amount of current pulse decrease being approximately 0.05C/second, absent any criticality, is only considered to be the use of "optimum" values that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result effective variable involves only routine skill in the art. ***In re Boesch***, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **See also MPEP 2144.05 statement with regard to "obviousness of ranges".**

As to claim 21, the selected amount of current pulse width increase being approximately 10 milliseconds, absent any criticality, is only considered to be the use of "optimum" value that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result

effective variable involves only routine skill in the art. ***In re Boesch***, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **See also MPEP 2144.05 statement with regard t " bvi usness f ranges".**

As to claim 22, with regard to the limitation of having the control module further maintaining the quiescent voltage at the selected quiescent voltage level comprises decreasing the first width of the current pulse by a selected amount if the monitored quiescent voltage is greater than the selected quiescent voltage level, it is an inherent function of the charger controller disclosed by Ding to continuously monitor the battery parameters, recalculate the battery SOC, and determine whether charging is required by determining a battery's SOC on a frequent basis during the charging process and adjusting its charging algorithm according to the instantaneous charge receptivity of the battery being charged in order to promote an efficient and rapid battery charging process, and thereby facilitating optimum performance from the battery, and MPEP 2100 states that the disclosure of a limitation may be expressed, implicit or **inherent.**

As to claim 23, the selected amount of current pulse width decrease being approximately 10 milliseconds, absent any criticality, is only considered to be the use of "optimum" value that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result effective variable involves only routine skill in the art. ***In re Boesch***, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **See also MPEP 2144.05 statement with regard to "obviousness of ranges".**

12. Claims 24-27, 29, 30, 32, 55-64 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ding**, as described above, in view of **Kimura et al.** [hereinafter Kimura][6573687].

To continue prosecution it was assumed that the applicant recited how the SOC changes as battery charging and discharging are repeated.

Ding discloses a battery charging system comprising a power supply that provides cyclic charging pulses to a battery, a battery monitoring circuit monitoring one or more of battery's parameters that respond to the charging pulses, and a control module that adjusts the configuration of the current component of the charging pulses so as to maintain the voltage component in a range between the

quiescent voltage/SOC and the maximum voltage/"SOC reaches 100% in response" to the monitored battery parameter. Ding does not disclose how the SOC changes as battery charging and discharging are repeated.

Kimura discloses in fig.3 how the SOC changes as battery charging and discharging are repeated, such that the proportion of the discharge amount with respect to the charge amount is equal to the charging efficiency corresponding to the target value of SOC [column 2, lines 9-45].Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Ding's apparatus and include repeated battery charging and discharging, as disclosed by Kimura, in order to be able to reach maximum charging efficiency.

As to claim 25, the discharging pulse having an amplitude with a value in a range of approximately 20 to 200 Coulombs/second, absent any criticality, is only considered to be the use of "optimum" value that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result effective variable involves only routine skill in the art. ***In re Boesch***, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **See also MPEP 2144.05 statement with regard to "obviousness of ranges".**

As to claim 26, the discharging pulse width having an amplitude with a value in a range of approximately 1 to 20 milliseconds, absent any criticality, is only considered to be the use of "optimum" value that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result effective variable involves only routine skill in the art. ***In re Boesch***, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **See also MPEP 2144.05 statement with regard to "obviousness of ranges".**

As to claim 27, Kimura discloses in fig.3 how cells with a SOC of less than 50% will undergo an increase in the SOC as the accumulated charge gradually increases with each charge and discharge. One skilled in the art would be able to interpret that Ding's and Kimura's battery monitoring circuit monitors

the quiescent voltage and a voltage immediately following the discharging pulse wherein a post-discharge voltage is defined as the difference between the voltage immediately following the discharging pulse and the quiescent voltage and wherein the postdischarge voltage is indicative of the effectiveness of the discharge process.

As to claim 29, the selected post-discharge voltage level being approximately 0.2 volt, absent any criticality, is only considered to be the use of "optimum" value that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result effective variable involves only routine skill in the art. ***In re Boesch***, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **See also MPEP 2144.05 statement with regard to "obviousness of ranges".**

As to claim 30, maintaining the post-discharge voltage at the selected post-discharge voltage level comprises maintaining the existing configuration of the current component if the monitored post-discharge voltage is approximately equal to the selected post-discharge voltage level: Ding and Kimura disclose that Individual cells with a SOC of 50% maintain the 50% state [column 4, lines 3-5].

As to claim 32, the selected value of discharging pulse amplitude decrease is approximately 0.05 C/second, absent any criticality, is only considered to be the use of "optimum" value that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result effective variable involves only routine skill in the art. ***In re Boesch***, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **See also MPEP 2144.05 statement with regard to "obviousness of ranges".**

As to claim 31 and 33, "maintaining the post-discharge voltage at the selected post-discharge voltage level comprises decreasing the discharging pulse amplitude by a selected amount if the monitored post-discharge voltage is less than the selected post-discharge voltage level", and "maintaining the post-discharge voltage at the selected post-discharge voltage level comprises increasing the discharging pulse amplitude by a selected amount if the monitored post-discharge voltage is greater than the selected post-discharge voltage level" it is an inherent function of the charger controller disclosed by

Ding and Kimura to continuously reconfigure the discharging pulse amplitude by a selected amount by determining a battery's SOC on a frequent basis during the charging process and adjusting its charging algorithm according to the instantaneous charge receptivity of the battery being charged in order to promote an efficient and rapid battery charging process, and thereby facilitating optimum performance from the battery, and MPEP 2100 states that the disclosure of a limitation may be expressed, implicit or **inherent.**

As to claim 34, the selected amount of discharging pulse amplitude increase being approximately 0.5 C/second, absent any criticality, is only considered to be the use of "optimum" value that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result effective variable involves only routine skill in the art. ***In re Boesch***, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **See also MPEP 2144.05 statement with regard to "obviousness of ranges".**

13. Claims 35, 65 and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ding**, as described above, in view of **Armstrong, II et al.** [hereinafter Armstrong] [6377028].

Ding discloses a battery charging system comprising: a power supply that provides cyclic charging pulses to a battery, a battery monitoring circuit monitoring one or more of battery's parameters that respond to the charging pulses, and a control module that adjusts the configuration of the current component of the charging pulses so as to maintain the voltage component in a range between the quiescent voltage/SOC and the maximum voltage/"SOC reaches 100% in response" to the monitored battery parameter. Ding does not disclose monitoring a duty cycle of the pulse charging cycle to determine state of charge of the battery wherein the duty cycle comprises a ratio of charging pulse width to the charging cycle period.

Armstrong discloses monitoring the current duty cycle during pulse charging modulated so that the average charge rate does not exceed that allowable for a particular battery [see also column 17, lines 2-5]. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Ding's apparatus and include monitoring the current duty cycle during

pulse charging, as disclosed by Armstrong, in order to modulate so that the average charge rate does not exceed that allowable for a particular battery.

With regard to the duty cycle comprising a ratio of charging pulse width to the charging cycle period: the duty cycle is defined as the ratio as the ratio of transmitted pulse width to pulse repetition interval [see also IEEE, 7th edition, page 345].

With respect to the method claims 37-66: the method steps will be met during the normal operation of the apparatus described above.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art cited in PTO-892 and not mentioned above disclose related apparatus.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Pia Tibbits whose telephone number is (703) 308-7305. If unavailable, contact the Supervisory Patent Examiner Mike Sherry whose telephone number is (703) 308-1680.

16. Any inquiry of a general nature or relating to the status of this application should be directed to the Technology Center receptionist whose telephone number is (703) 308-0956.

Papers related to Technology Center 2800 applications only may be submitted to Technology Center 2800 by facsimile transmission. Any transmission not to be considered an official response must be clearly marked "DRAFT". The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Technology Center Fax Center number is (703) 872-9306.

PFT

January 13, 2004